United States Department of the Interior

FISH AND WILDLIFE SERVICE
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JAN 30 2004

Consultation No. 2-15-03-F-480

Larry Butler, Ph.D.
State Conservationist
Natural Resources Conservation Service
101 South Main Street
Temple, Texas 76501-7602

Dear ~~Dr. Butler~~ Larry:

Enclosed is the U.S. Fish and Wildlife Service's (Service) biological opinion for the U.S. Department of Agriculture's (USDA) assistance programs on lands owned and managed by the members of the Reeves County Water Improvement District #1 (District) located in Reeves County, Texas. The opinion evaluates the effects of these programs to the endangered Comanche Springs pupfish (*Cyprinodon elegans*), Pecos gambusia (*Gambusia nobilis*), and Pecos (=Puzzle) sunflower (*Helianthus paradoxus*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

Thanks for your cooperation in completing this consultation process and your continued efforts for the conservation of threatened and endangered species in Texas. For additional questions regarding this project, please contact Mr. Nathan Allan, 512-490-0057, extension 237.

Sincerely,

Robert T. Pine
Supervisor

Enclosure

TAKE PRIDE IN AMERICA

United States Department of the Interior

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Dear Dr. Butler:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the implementation of the U.S. Department of Agriculture's (USDA) assistance programs on lands owned and managed by the members of the Reeves County Water Improvement District #1 (District) located in Reeves County, Texas, and its effects on the endangered Comanche Springs pupfish (*Cyprinodon elegans*), Pecos gambusia (*Gambusia nobilis*), and Pecos (=Puzzle) sunflower (*Helianthus paradoxus*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). Your September 3, 2003, request for formal consultation was received on September 8, 2003.

In your biological assessment, you determined that the proposed action is likely to adversely affect the two fishes and requested formal consultation. You also determined that the proposed action may affect, but is not likely to adversely affect the Pecos sunflower. We concur with your determination for the sunflower based on the limited distribution of the species on the East Sandia Springs Preserve, owned and managed by The Nature Conservancy. The proposed actions involve surface water activities that are not likely to adversely affect the sunflower.

This biological opinion is based on: information provided in the September 3, 2003, Biological Assessment (BA); telephone conversations with Mr. Gary Valentine and Mr. Sonny Vela, Natural Resources Conservation Service (NRCS); field investigations; a July 14, 2003, meeting with Mr. Larry Turnbough, President of the Board of Directors for the District; and other sources of information. A complete administrative record of this consultation is on file at this office.

Consultation History

The Service has had a long and active partnership with the District, the Texas Parks and Wildlife Department (TPWD), Texas Department of Agriculture (TDA), NRCS, and others, in conservation of the endangered fishes that occur in the springs and irrigation system in the Balmorhea area of Reeves and Jeff Davis counties. The San Solomon Ciénega (spring-fed marsh) project by TPWD, the District, and a host of other cooperators was a significant step in the history of conservation of the area's aquatic biota. During the planning of the project, it was envisioned that the District needed a mechanism to ensure compliance with the Act for their current and ongoing irrigation operations. This need was noted in the 1993 Memorandum of Understanding between TPWD and the District. The Ciénega was constructed in 1995 and TPWD monitored its beneficial effects over the last few years to document that the endangered fishes are using this new, protected habitat. Numerous discussions among agency personnel occurred in the intervening years about the most appropriate process to facilitate the District's ultimate compliance with the Act.

During the July 14, 2003, meeting in Balmorhea between the District, the Service, and the TPWD, it was determined that the NRCS, through the implementation of their land and water conservation assistance programs on District lands, should be the lead federal agency for section 7 consultation. A September 3, 2003, Biological Assessment (BA) was provided by NRCS to the Service on September 8, 2003. Drafts of the BA had been previously reviewed and modified by TPWD, the District, TDA, and the Service. The Service responded to NRCS by letter dated October 2, 2003, confirming that all the necessary information had been received from NRCS, or was otherwise available, to complete a draft biological opinion.

A draft of this biological opinion was transmitted to you on November 18, 2003. Comments were received verbally from Mr. Valentine on December 4, 2003. An updated "final draft" was provided to Mr. Valentine by email on December 16, 2003. NRCS then provided the draft for review to partnering agencies. You confirmed that you had no changes to offer in your January 26, 2004, letter.

BIOLOGICAL OPINION

I. Description of Proposed Action

Description of the Action Area

The Service has determined the action area to include all lands within the Reeves County Water Improvement District #1. The action area includes Phantom Lake Spring to the west to the eastward extent of the District lands. The area includes mostly private farms and lands along the canals serviced by the irrigation system, but also includes Balmorhea State Park. The District provides irrigation water to about 4,290 hectares (10,600 acres) extending about 6.4 kilometers (4 miles) west and 17.7 kilometers (11 miles) east of the town of Balmorhea, Texas, along Toyah Creek (Figures 1 and 2). The lands lie mostly within Reeves County and small portion in Jeff Davis County. Balmorhea is located in the Madera Valley of west Texas, 282 kilometers (175

miles) southeast of El Paso, 121 kilometers (75 miles) south of the Texas-New Mexico border. The Main Canal of the project snakes about 11 kilometers (7 miles) from west to east, connecting along the way the settlements of Toyahvale, Balmorhea, Brogada, and Saragosa (Bogener 1993).

The Madera Valley is situated between the eastern slope of the Davis Mountains and the Pecos River, in the Toyah Creek Basin. The small town of Balmorhea is situated on Toyah Creek near the center of the District. Toyah Creek is formed by the junction of the Madera, Big Aguja, and Little Aguja Creeks about 9.7 kilometers (6 miles) west of Balmorhea. These small tributary headwaters form at about 2,560 m (8,400 feet) elevation in the Davis Mountains before joining Toyah Creek. The normally dry creek flows northeast about 38.6 kilometers (24 miles) before forming the highly saline Toyah Lake, a few miles south of the Pecos River. Water used by the District is supplied by the outflow of natural springs. The Madera Valley is a long, narrow valley of lower Cretaceous limestones overlain with gravels. A large underground reservoir surfaces in this area as artesian springs including San Solomon and Giffin, at Toyahvale, four miles southwest of Balmorhea, and Phantom Lake Spring, three miles west of Toyahvale.

Irrigation improvements were originally designed and built by private interests beginning in the late 19th century, and the District was officially formed in 1915. The project was reconstructed by the U.S. Bureau of Reclamation (Reclamation), in 1946 and 1947 (Bogener 1993). Important Reclamation features of the project include Phantom Lake Canal; the Inlet Feeder Canal; and the Madera Diversion Dam, built by private interests and repaired by Reclamation.

The District holds State water rights for use of the surface water in the Toyah Basin and, in 1993, the District diverted approximately 23.9 million cubic meters (19,425 acre-feet) of local surface water from springs for agricultural irrigation (RCWID#1 2001). The District has 97 kilometers (60 miles) of open, lined canals and about 6.4 kilometers (4 miles) of unlined canals. The District has 83 Town Lot accounts and 106 accounts for farming. The District owns and operates Balmorhea Lake (also known as Lower Parks Reservoir), built in 1917. The District considers the reservoir at full capacity at approximately 9.1 million cubic meters (7,383 acre-feet) (RCWID#1 2001). Crops that are irrigated include cotton-upland, alfalfa, barley, oats, wheat, pasture (and other hay), pecans, melons, and cucumbers. Total area under cultivation in 1993, the last year information is available, was 1,638 hectares (4,047acres); down from 2,779 hectares (6,867 acres) in cultivation in 1986 (RCWID#1 2001).

Description of the Federal action

The description of the proposed action is based largely on information provided in the September 3, 2003, BA. The NRCS proposes to continue the implementation of USDA's assistance programs on lands owned and managed by the members of the Reeves County Water Improvement District #1 in Reeves County, Texas. These programs (described below) are intended to support and improve the irrigation operations of the District. Included as part of the Federal action under this consultation are the standard irrigation operations of the District.

Because the proposed action is a series of ongoing activities by NRCS, it is prudent to include a time-frame for the consultation. Therefore, this consultation will be in effect for 10 years from the date this biological opinion is signed by the Service. Ten years will allow a reasonable time for the proposed action and provide an opportunity to reevaluate the status of the species, particularly regarding the environmental baseline and the potential effects of declining spring flows and possible hybridization.

Some activities included in the proposed Federal action are authorized by the 2002 Farm Bill. This Federal legislation will expire in 2007 and will likely be replaced by new legislation to authorize USDA's assistance programs. These future programs may or may not deviate from the existing programs. If the programs are significantly altered in future legislation, reinititiation of this consultation may be necessary. Additional activities are expected to occur as part of the above described NRCS programs and other programs and activities, not specifically identified here, may also be included in the proposed action, so long as the potential effects to the species and incidental take statement in this biological opinion are not exceeded. The biological opinion may be extended with or without modifications at the end of the 10-year period with the mutual consent of both the Service and the NRCS.

The following USDA programs are included in the proposed action:

a. Environmental Quality Incentives Program (Financial Assistance)

The Environmental Quality Incentives Program (EQIP), authorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill), provides a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality. NRCS currently administers 10 EQIP contracts within the boundaries of the District. Another contract may be signed by year's end. USDA provides assistance to implement resource management systems that will reduce water use by customers of the District. Land leveling and irrigation water conveyance (pipelines) are the primary conservation practices that are cost-shared by the individual landowners. An additional four EQIP contracts are in effect to control the salt cedar, *Tamarix* spp., an introduced phreatophyte that consumes large amounts of water.

b. Conservation Reserve Program (Technical Assistance)

The Conservation Reserve Program (CRP), also authorized by the 2002 Farm Bill, is administered by USDA's Farm Services Agency, with NRCS providing technical assistance to producers in establishing conservation practices to control erosion and conserve water. Since the inception of this program in 1985, NRCS has assisted with planning and installing conservation practices on seven contracts within the District, with three additional contracts forthcoming. The primary practices installed are CP2, Establishment of Permanent Native Grasses, and CP22, Riparian Buffers. The purpose of CP2 is to establish a vegetative cover of native grasses on cropland to reduce soil erosion

and enhance other environmental benefits. The purpose of CP22 is to protect surface and subsurface water quality from soil erosion, pesticides, and nutrient pollution.

c. Other Technical Assistance

NRCS provides technical assistance upon request to all agricultural producers within the District. This assistance is intended to increase both production and efficiency, including a reduction in use of irrigation water. The primary conservation practices planned and applied are contour farming, field borders, irrigation water management, nutrient management, pest management, and conservation crop rotation.

NRCS is party to a memorandum of understanding (MOU) with the Toyah-Limpia Soil and Water Conservation District (SWCD). The SWCD, a governmental subdivision of Texas, is engaged in carrying out a long-range program of soil and water conservation in Reeves, Jeff Davis, Culberson and Pecos counties. Since the USDA has a common objective to conserve and protect our natural resources, this MOU authorizes both entities to cooperate in delivering technical assistance to all land and water users within the SWCD, including users within the District.

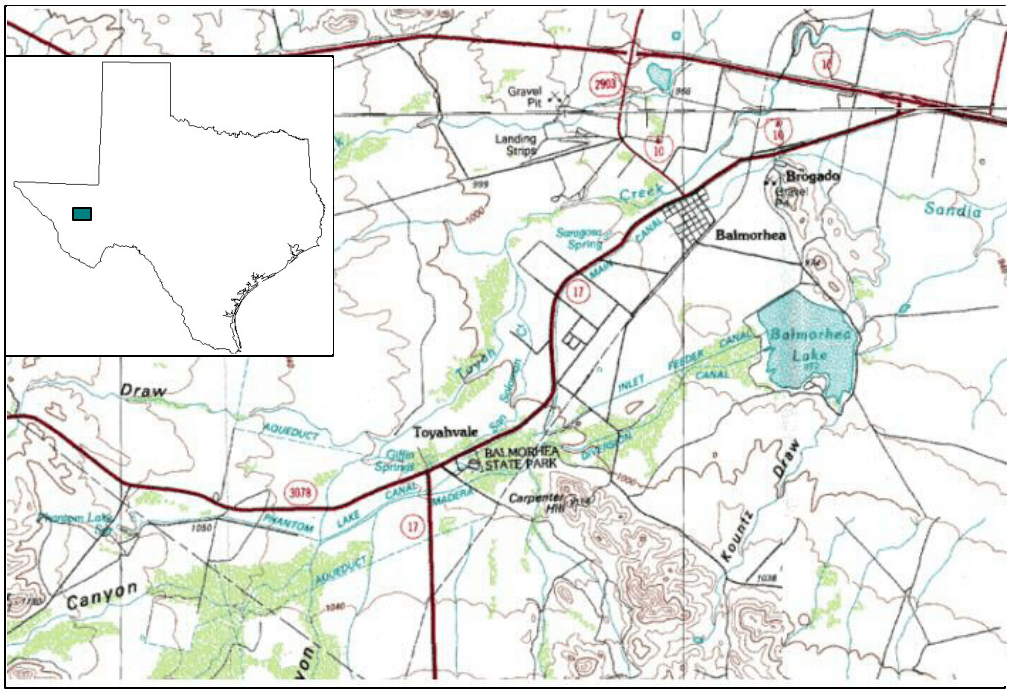


Figure 2.Aerial photo of a portion of the Reeves County Water Improvement

II. Status of the Species

The status of the species are those aspects of the species' biology and ecology that are relevant to the proposed action. The Comanche Springs pupfish and Pecos gambusia are federally endangered fishes, endemic to the Pecos River drainage, with the pupfish locally endemic to the Toyah Basin. Critical habitat has not been designated for either species.

Comanche Springs pupfish

a. Species description

Comanche Springs pupfish was listed as federally endangered in 1967 without critical habitat (32 FR 4001). In 1981, a recovery plan for the species was completed (Service 1981). Since then several updates of the recovery plan have been drafted but not yet completed. Comanche Springs pupfish is one of the most distinctive members of the genus *Cyprinodon* (Echelle et al. 2003). Males possess a unique speckled color pattern and all individuals have a relatively streamlined body shape. They lack the vertical bars on the sides of their bodies that are found in most other *Cyprinodon*. Comanche Springs pupfish are small fishes, individuals only attain a maximum size of approximately 50 millimeters (2 inches) standard length (SL) (Itzkowitz 1969, Echelle and Hubbs 1978, Service 1981).

b. Life history

Comanche Springs pupfish can breed in swifter water than all other known *Cyprinodon*. Males orient and maintain position upstream from their territories until a female enters the territory and positions herself near the algal mat substrate (Itzkowitz 1969). These territories are variable in size (averaging approximately 0.5 square meters (5.4 square feet)) and most often over algal mats. The males guard eggs until hatching and they aggressively defend their territories against intruders (Itzkowitz 1969). Courtship behaviors are similar to other species of *Cyprinodon* based upon the direct observations of Itzkowitz (1969) as well the existence of natural hybrids between *C. elegans* and introduced *C. variegatus* (sheepshead minnows) as documented by Stevenson and Buchanan (1973). Eggs are apparently laid singly onto the algal mat substrates of the male's territory (Itzkowitz 1969). Aquarium studies suggest females may lay 30 eggs per day and eggs hatch in 5 days at 20 ‹C (68 ‹F) (Cokendolpher 1978).

Comanche Springs pupfish are relatively short-lived fish with most individuals living approximately 1 year. This aspect, coupled with their reproductive biology, causes large fluctuations in population numbers. Gut analysis of 20 specimens by Winemiller and

Anderson (1997) revealed Comanche Springs pupfish eat mostly filamentous algae and some snails (*Cochliopa texana*).

Water emanating from the springs is stenothermal, approximately 22-26 ‹C (72-79 ‹F) (Stevenson and Buchanan 1973, Gehlbach et al. 1978, Brune 1981), however, exposure to ambient temperatures makes the waters in which Comanche Springs pupfish occur more eurythermal. Temperature preference experiments indicate that habitat temperatures between 20-30 ‹C (68-86 ‹F) during August and September are optimal (Gehlbach et al. 1978). Comanche Springs pupfish have a critical thermal maximum of approximately 40.5 ‹C (105 ‹F) and there is significant diurnal variation in the critical thermal maximum (higher in afternoon than morning) (Gehlbach et al. 1978).

c. Population dynamics

Estimated adult population size of the pupfish in the 1970s was about 1,000 or more in the vicinity of San Solomon Springs and perhaps several thousand in the irrigation canals (Echelle 1975). Densities are considered sparse in the irrigation canals due to lack of suitable habitat (Echelle 1975). During a two-year sampling study (Garrett and Price 1993), population size in the pupfish canal on Balmorhea State Park was estimated to be as low as 968 (May 1990) and as high as 6,480 (September 1990). Construction of the modified canal at Phantom Lake Spring resulted in an increase in local abundance, with an average of 14.7 individuals per square meter (Winemiller and Anderson 1997). During 1999 to 2001, the population in San Solomon Ciénega in Balmorhea State Park averaged 270,000 in summer to approximately 18,000 in winter (Garrett 2003).

d. Status and distribution

Comanche Springs pupfish originally inhabited two isolated spring systems approximately 90 kilometers (56 miles) apart in the Pecos River drainage of western Texas (Baird and Girard 1853). The type locality, Comanche Springs, inside the city limits of Fort Stockton, Pecos County, Texas, is now dry and the population at this locality is extinct. The other population is restricted to a small series of springs, their outflows, and a system of irrigation canals historically interconnecting Phantom Springs (located in easternmost Jeff Davis County, Texas), San Solomon Springs, Giffin Springs and Toyah Creek near Balmorhea, Reeves County, Texas (Echelle et al. 2003). The number of fish in the San Solomon Spring outflow have greatly increased in recent years as a result of the increased habitat availability from the San Solomon Ciénega.

Comanche Springs pupfish habitat has been markedly altered into an irrigation network of concrete-lined canals with swiftly flowing water and dredged earth-lined laterals. The area has been highly modified repeatedly over the past century for the benefit of irrigation agriculture (Bogener 1993). Waters from Phantom Lake Springs originally emerged from a cave and formed a ciénega that drained back into a cave. Subsequently water was captured in an irrigation canal as it emanated from the cave, but now there is

no outflow from Phantom Lake Spring. Water from San Solomon and Giffin springs flows into additional irrigation systems, some of which is stored for irrigation supply in Lake Balmorhea. The aquatic habitat in the canals is highly impacted, ephemeral, and very dependent upon local irrigation practices and other water-use patterns. For the most part, the irrigation canals provide little suitable habitat for Comanche Springs pupfish (Service 1981). Also, in order to repair or re-dredge canals, flows are sometimes diverted causing mortalities of Comanche Springs pupfish (Davis 1979).

Primary threats to the Comanche Springs pupfish include the loss of aquatic habitat due to declining spring flows and hybridization with the introduced fish, sheepshead minnow (*Cyprinodon variegatus*). For example, flows from Phantom Lake Spring have been declining since measurements have been taken in the 1930s (Figure 3) (Brune 1981). Also, it was the complete loss of spring habitat from Comanche Springs in Fort Stockton that extirpated the fish from its type locality. Comanche Springs pupfish readily hybridize with sheepshead minnow and are eventually replaced by the nonnative congener. A large population of sheepshead minnow occur in Lake Balmorhea (Stevenson and Buchanan 1973, Echelle and Echelle 1994) and expansion of the nonnative species into upstream areas of the spring outflows is a constant threat to the existence of the species in the wild.

Phantom Lake Spring ceased flowing during the summer of 1999 and has not recovered (Figure 3). There is now only a small pool remaining at the cave mouth and the water is provided by a pump system cycling water from inside the cave to the springhead and allowing flow back into the cave. The fish populations at this site are severely impacted from loss of habitat, resulting in extremely small population sizes. Less than 100 individuals of gambusia and 50 individuals of pupfish are likely present (N. Allan, Service, personal observation, 2003). Maintenance of the habitat for these gentically-unique populations is exclusively dependent on the pumping system.

The Service is maintaining captive stocks of *Cyprinodon elegans* at the Dexter National Fish Hatchery and Technology Center, Dexter, New Mexico and the Uvalde National Fish Hatchery, Uvalde County, Texas. The Uvalde population originated from 73 individuals collected from the distinctive subpopulation at Phantom Lake Springs (Garrett and Price 1993). The Dexter population came from individuals taken from the Uvalde stock in 2003 following a genetic evaluation of the stock (Echelle and Echelle 2002).

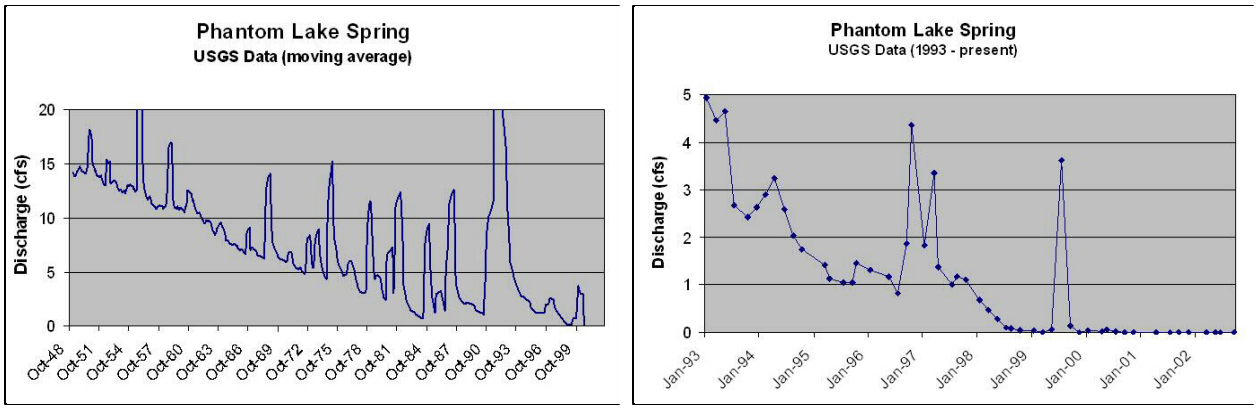


Figure 3.Historic (left) and recent (right) flows from Phantom Lake Spring, Jeff Davis County,

Pecos gambusia

Baird and Girard (1853) described Pecos gambusia based on material from Leon and Comanche springs, Pecos County, Texas. Leon Springs was later designated the type locality (Hubbs and Springer 1957). This fish has been listed as federally endangered since 1970. The Pecos gambusia is a relatively robust *Gambusia*, with an arched back and a caudal peduncle depth that is approximately two-thirds of the head length. The margins of the scale pockets are outlined in black and spots are normally absent on the caudal fin, however, sometimes a faint medial row of spots may be present. The dorsal fin has a subbasal row of spots. Females have a prominent black area on the abdomen that surrounds the anus and anal fin. The male gonopodium has a number of unique features including elongated spines on ray 3, small rounded hooks on the tips of rays 4p and 5a, and an elbow on ray 4a consisting of 3 or 4 fused segments located opposite the serrae of ray 4p (Hubbs and Springer 1957, Koster 1957, Bednarz 1975, Echelle and Echelle 1986).

Populations in Toyah Creek (Texas) and Blue Spring (New Mexico) were found to be the most diverse morphologically and genetically and the Toyah Creek population had the greatest genetic heterogeneity (Echelle and Echelle 1986, Echelle et al. 1989).

b. Life history

Pecos gambusias produce live young. Bednarz (1979) reported that the number of embryos was related to female size and that the mean number of embryos was 38 in the

Blue Spring population. Hubbs (1996) found that the birth weight of Pecos gambusia from Texas populations ranged between 35 and 50 milligrams (0.0012 and 0.0018 ounces) and females had an interbrood interval averaging 52 days. Hybrids between Pecos gambusia and western mosquitofish (*Gambusia affinis*) or largespring gambusia (*G. geiseri*) are occasionally found, especially in habitats where one of the species is rare (Hubbs and Springer 1957, Service 1983).

Pecos gambusias inhabit stenothermal springs, runs, spring-influenced marshes (ciénegas), and irrigation canals carrying spring waters (Service 1983, Hubbs 2003). Some populations are also known from areas with little spring influence; these habitats generally have abundant overhead cover, and include sedge-covered marshes and gypsum sinkholes (Echelle and Echelle 1980). One or two other *Gambusia* may also be found in association with *G. nobilis*. Where the western mosquitofish is found, *G. nobilis* inhabits stenothermal waters and western mosquitofish is most often found in eurythermal habitats. Where the largespring gambusia has been introduced, the Pecos gambusia is much more likely to be found associated with vegetation or in deeper waters, while largespring gambusia tends to be at the surface or in open water over non-vegetated substrates (Hubbs et al. 1995, Hubbs 2001, 2003). Pecos gambusias feed relatively non-selectively, consuming a diversity of food types, including; amphipods, dipterans, cladocerans, filamentous algae, arachnids and mollusks (Hubbs et al. 1978, Winemiller and Anderson 1997).

c. Population dynamics

Where suitable habitats exist, Pecos gambusia populations can be dense. An estimated 27,000 individuals inhabit the Bitter Lake National Wildlife Refuge area, and 900,000 inhabit Blue Spring (Bednarz 1975, 1979). Approximately 100,000 Pecos gambusia are estimated to inhabit the Balmorhea springs complex and more than 100,000 in the Diamond Y springs and draw (Service 1983).

d. Status and distribution

The Pecos gambusia is endemic to the Pecos River basin in southeastern New Mexico and western Texas and originally ranged from near Fort Sumner, New Mexico to the area around Fort Stockton, Texas. At present, the species is restricted to four main areas, two in New Mexico and two in Texas. Populations live in various springs and sinkholes in Bitter Lake National Wildlife Refuge, near Roswell, New Mexico; Blue Spring, east of Carlsbad Caverns National Park, New Mexico; the Diamond Y springs and draw (=Leon Creek), near Fort Stockton, Texas; and the Toyah Basin (San Solomon springs complex) near Balmorhea, Texas. Extirpated populations include the Pecos River near Fort Sumner and North Spring River in New Mexico, and Leon and Comanche springs, which are now dry, in Texas.

The Pecos gambusia faces severe threats from spring flow declines and habitat modification throughout their range. Loss of outflow in Phantom Lake Spring (described earlier) has also affected the local population of Pecos gambusia. Currently, the total number of individuals persisting at Phantom Lake Spring is estimated to be less than 100 (N. Allan, Service, personal observation, 2003). Throughout their historic range, ciénegas, presumed to have supported large numbers of Pecos gambusia, have been systematically drained and spring flows diverted for irrigation. Additional stresses on the population may occur through competition with the introduced largespring gambusia.

III. Environmental Baseline

The environmental baseline provides an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem, within the action area. The environmental baseline is a "snapshot" of a species' health at a specified point in time. It does not include the effects of the action under review in the consultation.

a. Status of the species within the action area

Comanche Springs pupfish

The current range of the Comanche Springs pupfish in the wild is entirely included within the action area. As described in the BA, section *4.1.1 Comanche Springs pupfish*, the pupfish are assumed to occur throughout much of the irrigation system, including spring outflows and irrigation canals (Echelle 1975, Echelle and Echelle 1980, Garrett et al. 1993). Although the published information on distribution is somewhat dated, it is assumed that, generally, the occurrence of the pupfish is widespread within the action area.

Pecos gambusia

In broad terms of populations, the action area represents one of four known current locations of Pecos gambusia. The population on Bitter Lake National Wildlife Refuge in New Mexico is probably the largest in existence, as it includes multiple locations in small sinkholes and spring outlet habitats. Also, as reported in the BA, section *4.1.2 Pecos gambusia*, they are primarily limited to occur in the immediate spring outflows in the project area due to thermal preferences of the fish (Echelle 1975, Echelle and Echelle 1980, Garrett et al. 1993, Hubbs et al. 1995, Hubbs 2001). Based on the best available data, Pecos gambusia likely only occur in the project area, downstream of spring outflows, in very small numbers.

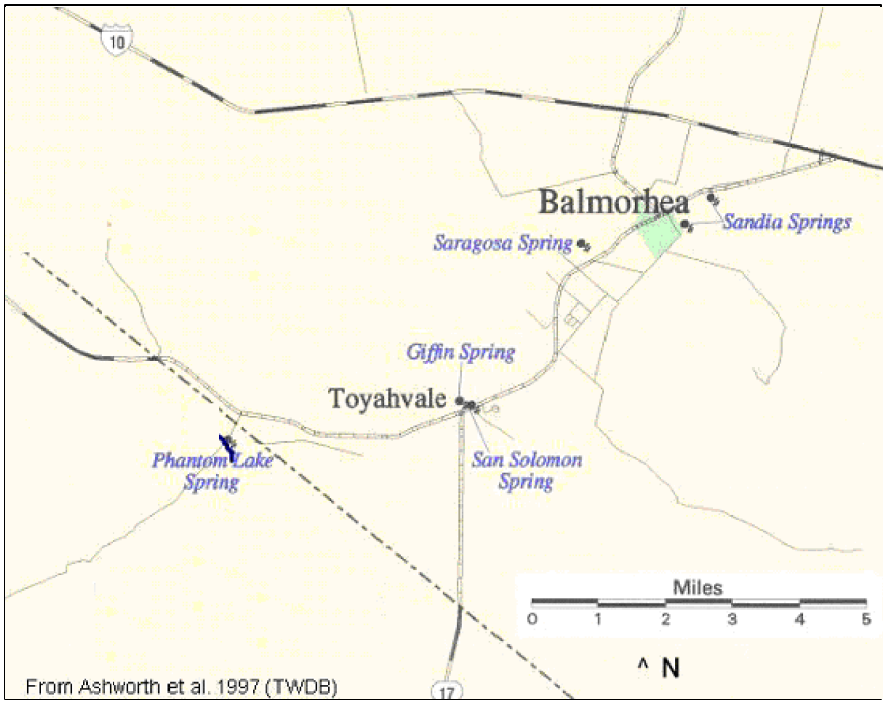
b. Factors affecting species environment within the action area

Aquatic Habitats

Surface waters in the project area that provide habitat for the two endangered fishes are exclusively supported by springflows that discharge from groundwater aquifers. Many of the aquifers in this arid area of west Texas receive little to no recharge (Scanlon et al. 2001) and are influenced by regional flow patterns (Sharp 2001). These spring habitats form the ecosystems upon which the listed species, and other rare species, depend. Management and conservation of these habitats is the key for ensuring the continued survival of listed species. Historically, these systems were likely interconnected as portions of the overall Toyah Creek watershed. In recent times, man-made structures altered the patterns of spring runoff and impounded excess water in Balmorhea Lake.

The base flows from springs of the Balmorhea area (Figure 4) are likely discharge points of a regional flow system from aquifers associated with the Salt Basin, west of the Delaware Mountains, and Wildhorse Flat, west of the Apache Mountains, Culberson County (Sharp 2001, Sharp et al. 2003, Texas Water Development Board, unpublished data). The relationships of the supporting aquifers for the springs are not well defined. Recent studies (LaFave and Sharp 1987, Schuster 1997, Sharp et al. 1999) indicate that "base flow" comes from a regional groundwater system, while the springs are locally recharged by runoff from the Davis Mountains, resulting in the flow spikes. Similar water chemistry, water age, and near constant temperatures of about 26 ‹C (79 ‹F), among these three springs (Phantom Lake, San Solomon, and Giffin), indicate that their waters originate from the same source of Cretaceous Limestone (Schuster 1997).

An assessment of the springs near Balmorhea by Sharp (2001) concluded:
"The effects of humans on the Toyah Basin aquifer have been significant. Irrigation pumpage increased rapidly after 1945. Many springs in the area have since ceased to flow (Brune 1981). Irrigation pumpage from the Toyah Basin lowered water-table elevations and created a cone of depression. Thus, pumpage totals altered the regional-flow-system discharge zone from the Pecos River to irrigation wells within the Toyah Basin (LaFave and Sharp 1987; Schuster 1997; Boghici 1997). … The Groundwater Field Methods classes found water-level declines near Balmorhea Springs of about 20 ft with respect to the 1932 data (White et al. 1938). Recent declines of pumpage for irrigation because of economic conditions has allowed partial recovery of water levels, but it seems doubtful that predevelopment conditions will be achieved."



Each of the aquatic habitats in the project area are briefly characterized below, based on information provided in the BA.

San Solomon Spring

San Solomon Spring is by far the largest spring in the Balmorhea area (N30‹56'40", W103‹47'08"). It provides the water for the swimming pool at Balmorhea State Park and most of the irrigation water for the District. The artesian spring issues from the lower Cretaceous limestones at an elevation of 1020 meters (3,346 feet). Although long-term data are scarce, San Solomon Spring flows have declined somewhat over the history of record, but not as much as Phantom Lake Spring (Schuster 1997, Sharp et al. 1999). Some recent declines in overall flow have likely occurred due to drought conditions and declining aquifer levels. San Solomon Spring discharges are usually in the 20 to 30 cubic-feet/second (0.57 to 0.85 cubic-meters/second) range (Ashworth et al. 1997, Schuster 1997) and are consistent with the theory that the water bypassing Phantom Lake Spring discharges at the San Solomon Spring.

Figure 4. Location of springs near Balmorhea, Texas.

Phantom Lake Spring

Phantom Lake Spring is located approximately 6.4 kilometers (4 miles) west of Balmorhea State Park (N30<56'06", W103<50'58"), just over the Reeves County line in Jeff Davis County. The 6.9-hectare (17-acre) site around the spring and cave opening is owned by the Bureau of Reclamation and managed by Texas Parks and Wildlife Department under a cooperative management agreement. The site includes a 120-meter (394-feet) pupfish refuge canal and is surrounded by an outcrop of limestone cliffs. It is an important site for wildlife, especially small mammals, bats, and birds. State park staff conducts guided tours at the site on a scheduled basis.

Flow from Phantom Lake Spring was originally isolated from the other waters in the system and recharged underground. Modifications to the spring outflow channeled waters into Toyah Creek, west of San Solomon and Giffin springs (White et al. 1941) for use by local landowners and irrigation by the District. Flows from Phantom Lake Spring have been declining since measurements were taken in the 1930's (Brune 1981). Flow from Phantom Lake Spring has not been sufficient to support irrigation by the District for many years.

Exploration of Phantom Cave by cave divers has led to additional information about the nature of the spring and its supporting aquifer (pers. comm., Bill Tucker, Tucker's Dive Shop, 1999). Beyond the entrance, the cave is a substantial conduit that transports a large volume of water generally from the northwest to the southeast, consistent with regional flow pattern hypothesis. Over 2,438 meters (8,000 feet) of the cave conduit have been mapped so far. In addition, flows have been measured and are in the 0.7 cubic-meters/second (25 cubic-feet/second) range. The relatively small flow at Phantom Lake Spring is essentially an overflow of a larger flow system underground. Waters from Phantom Lake Spring issue at an elevation of 1,080 meters (3,543 feet), resulting in this spring failing before those near San Solomon, as was predicted by White et al. (1941).

Phantom Lake Spring ceased flow during the summer of 1999 and has not recovered (Figure 3). The small pool remaining at the cave mouth is now maintained by a pump system cycling water from inside the cave to the springhead and allowing flow back into the cave.

Giffin Spring

This site is located less than 1.6 kilometers (one mile) west, across State Highway 17, of Balmorhea State Park (N30<56'45", W103<47'23"). Access is restricted because the spring is on private property. Brune (1981) documented a gradual decline in flow from Giffin Spring between the 1930's and 1970's, but surprisingly the discharge has remained near constant, within outflow of about 0.08 to 0.1 cubic-meters/second (3 to 4 cubic-feet/second) in recent times (Ashworth et al. 1997). The outflow channels have been modified to accommodate irrigation for downstream canals.

East and West Sandia Springs

These two historically significant springs are located approximately 3.2 kilometers (2 miles) east of Balmorhea near the community of Brogado (N30«59'28", W10343'44"). The springs are included in a 97-hectare (240-acre) preserve owned and managed by The Nature Conservancy (Karges 2003). A significant sacaton grassland is associated with the habitat included on the site.

Flows from East Sandia Spring are likely from a shallow groundwater source as water chemistry differences indicate it is not directly connected with other Toyah Basin springs (San Solomon Spring, Phantom Lake Spring, Giffin Spring) in the nearby area (LaFave and Sharp 1987; Schuster 1997). East Sandia Spring discharges at an elevation of 977 meters (3,224 feet) from alluvial sand and gravel (Schuster 1997). Brune (1981) noted that flows from Sandia Springs were declining. East Sandia may be very susceptible to over pumping in the area of the local aquifer that supports the spring. Measured discharges in 1995 and 1996 ranged from 12.7 to 115 liters/second (0.45 to 4.07 cubic-feet/second) (Schuster 1997). The small outflow channels from East Sandia Spring have not been significantly modified and water flows into the District irrigation system about 100 to 200 meters (328 to 656 feet) after surfacing. West Sandia Spring has virtually ceased flowing in recent times and the presence of rare species there is considered unlikely.

Saragosa and Toyah Creek Springs

Toyah Creek was, and remains, an intermittent tributary (i.e., flowing only after intense rainfall) of the Pecos River. Several small springs (e.g., Saragosa) at Balmorhea likely once formed ciénegas that probably supported populations of the native aquatic species. Brune (1981) recorded the decline and eventual failure of Saragosa Springs showing a decrease from more than 400 liters/second (14 cubic-feet/second) in the 1930's to zero by the 1970's. Only the lowest springs have flowed since that time, and the springs are functionally gone now and no longer provide habitat for native species (G. Garrett, pers. comm.).

Irrigation Canals

The District maintains an extensive system of over 97 kilometers (60 miles) of irrigation canals (see above) that provides minimal aquatic habitat for the native species. Most of the canals are concrete-lined with high velocities and little natural substrate available. Many of the canals are regularly dewatered as part of the normal District operations for water management. There is constant colonization in the canals from individual fish that disperse downstream from Balmorhea State Park, so long as the population on the park is healthy. However, due to a number of small diversion structures throughout the canal system, fish in downstream locations are not likely to swim back upstream, once they move out of the park area. It is unknown whether populations of fishes (both Comanche Springs pupfish and Pecos gambusia) are able to complete their life history requirements

in the canals, or if these populations are dependent upon dispersal of individuals from the park upstream.

The Comanche Springs Pupfish Recovery Plan addressed the canal system and its relative unimportance to the recovery of the species (Service 1981, pp. 6-7):

> "Much of the present Balmorhea canal system is unsuitable for the Comanche Springs pupfish. ... These manipulations of water flow cause some variations in numbers and in the extent of pupfish living space but are considered minor impediments to the survival and recovery of the pupfish when compared to habitat loss and the other major threats facing the species (see Major Threats)."

Balmorhea Lake

This reservoir is owned and operated by the District to impound water for irrigation purposes. The reservoir is approximately 232 hectares (573 acres) in size and holds about 8.6 million cubic meters (7,000 acre-feet) of water at maximum pool elevation. The earthen dam that forms Balmorhea Lake was built in 1917. The reservoir is located approximately 2 miles southeast of the town of Balmorhea at 30°58' N, 103°44' W. Water discharged from San Solomon Springs is received at the lake via a concrete lined canal that originates within Balmorhea State Park. Sandia Creek feeds into the reservoir from the northeast, and Kountz Draw empties into it from the south. Runoff from Toyah Creek comes into Balmorhea Lake from Madera Diversion Dam and its canals. Surplus water from Phantom Lake Canal was stored in Balmorhea Lake when that spring flowed. The lake is an important resource for both resident and migratory birds and holds a significant fishery that is managed by TPWD. The existence of the nonnative sheepshead minnow in Balmorhea Lake poses a significant threat to the closely related Comanche Springs pupfish.

Nonnative species

The presence of nonnative aquatic species in the habitats of the endangered fishes poses a continual threat. This factor is most important in the survival of the Comanche Springs pupfish, which readily hybridizes with sheepshead minnows. The sheepshead minnows are very similar morphologically to Comanche Springs pupfish, especially to persons not trained in fish identification. Currently, the sheepshead minnows are restricted to Lake Balmorhea and the canals downstream of the lake.

Largespring gambusia has been introduced and is well established throughout the action area. Hybrids with largespring gambusia and Pecos gambusia are occasionally found, but do not appear to be common (Hubbs and Springer 1957, Service 1983). Some competition between the two likely occurs, but separations in microhabitat apparently provide separate ecological niches (Hubbs et al. 1995, Hubbs 2001, 2003).

Habitat quality

The natural ciénega habitats of the action area have been mostly altered over time to accommodate agricultural irrigation. Most significant was the draining of wetland areas and the modification of spring outlets for development of human use of the water resources. Although the physical condition of the areas has changed dramatically over time from human actions, much of the native biota appears to remain intact.

The District maintains an extensive system of over 97 kilometers (60 miles) of irrigation canals that provides some aquatic habitat for the native species. Most of the canals are concrete-lined with high velocities and little available natural substrate. Many of the canals are regularly dewatered as part of the routine District operations for water management. There is constant colonization in the canals from individual fish that disperse downstream from upstream spring outlets and the San Solomon Ciénega. However, due to a number of small diversion structures throughout the canal system, fish in downstream locations are not likely to swim back upstream, once they move out of the spring outflow areas or downstream of Balmorhea State Park. It is unknown whether populations of fishes (both Comanche Springs pupfish and Pecos gambusia) are able to complete their life history requirements in the canals, or if these populations are dependent upon dispersal of individuals from upstream.

Past Federal actions with complete consultations

One recent section 7 consultation in the action area was completed with the U.S. Bureau of Reclamation for the installation of the emergency pumping system at Phantom Lake Spring. The intention of the action was to preserve the spring habitat to the maximum extent practicable by pumping water from inside Phantom Cave to the spring outlet. The consultation was completed with a nonjeopardy biological opinion on May 11, 2000 (Consultation No. 2-15-00-F-679). It authorized incidental take, in the form of harassment and harm, of up to 50 individuals of Comanche Springs pupfish and 50 individuals of Pecos gambusia in the cave mouth of Phantom Lake Spring. Reasonable and prudent measures to minimize take of the action included:

1. Implement all construction phases of the installation of the pipeline, pump, and check dam using methods to minimize the disturbance of the sediments and banks of the Phantom Cave pool and minimize the area to be disturbed.

2. After or during construction of the check dam, if feasible, move fish from upstream of the check dam to downstream of the check dam.

3. Operate and maintain the pumping system so as to minimize any potential for pollutants to enter the water, especially refueling of the pump. If possible, refueling activities should occur downstream from the refuge channel and away from the water to avoid contamination.

4. No pollutants should be handled immediately over spring water. The pump will be placed in a plastic lined, bermed depression to prevent the loss of any potential pollutants. An emergency spill kit (personnel instructed in its use) should be on site to allow for an immediate response to any spill.

5. Any endangered fish found stranded in isolated pools (during the pilot project or if the pump fails) should be collected with seines or dip nets and moved to the pool at the mouth of the cave.

6. Electric pumps should be used in most cases to minimize risk of contaminant spills, except during the pilot project and for back-up purposes.

7. Store any fuel or other contaminants and equipment that could pollute the water away from the springs or any source to the aquifer.

8. Fix the stop log structure at the entrance to the irrigation canal (bench flume) to eliminate the vandalism problem that allows water to bypass the refuge channel.

Other previous Federal actions, which were implemented prior to the Endangered Species Act, include the rehabilitation of the irrigation system in 1946 to 1947. This federal project provided much of the modern system of dams and canals in existence today (Bogener 1993).

No future Federal actions, other than the proposed action, are currently anticipated in the action area.

Non-federal actions

For nearly a century, the District has operated and maintained the canal system for the benefit of water users. Many activities have been implemented to improve the efficient use of water for irrigation agriculture. These activities include construction and maintenance of diversion structures, main canals, lateral canals, gates, monitoring devices, etc.

TPWD owns and manages Balmorhea State Park, which is 18.6 hectares (45.9 acres) about 6.4 kilometers (4 miles) southwest of Balmorhea**.** The park is managed for the benefit of visitors as well as the conservation of the rare and protected aquatic species. The park includes the 7,158 square-meter (77,053 square-foot) swimming pool where San Solomon Spring originates; the pupfish canal, constructed in the 1970s; and the San Solomon Ciénega, constructed in the mid-1990s. TPWD cleans the swimming pool annually by drawing down the pool and diverting spring flow down the northern drainage canal, rather than the main concrete canal. It normally takes about 5 days to complete the annual pool maintenance.

The 1.2-hectare (3-acre) San Solomon Ciénega is an artificial wetland situated within the boundaries of the original, natural ciénega and is on State park land (McCorkle et al. 1998). It was designed to resemble and function like the original ciénega for the native fish fauna, including Comanche Springs pupfish and Pecos gambusia. The District and the local community it represents, agreed to provide the essential water needed to create a secure environment for the endangered species. The main purpose of this restoration project was to recreate vital habitat, not only for the two endangered fishes, but for other aquatic, terrestrial, and wetland-adapted organisms as well. An observation deck provides an unobstructed view of most of the above-water portion of the ciénega, and a window wall yields an underwater view of life in the ciénega. This location now contains the largest known concentration of Comanche Springs pupfish (summer population averages 270,000) (Garrett 2003).

TPWD provides management assistance, documented in an interagency memorandum of understanding, to the Bureau of Reclamation for maintenance of the property at Phantom Lake Spring. Phantom Lake Spring is an important site for wildlife, especially small mammals, bats, and birds. State park staff sometimes conduct guided tours at the site.

TPWD also provides management assistance to the District for the recreational fishery in Balmorhea Lake. In a coordinated effort with the District, Lake Balmorhea was partially drained in 1998 and all fish were killed by application of rotenone. This was an attempt to eradicate the large population of *C. variegatus* that inhabited the lake and posed a threat to Comanche Springs pupfish. Post-rotenone extrapolation of subsamples put the population of sheepshead minnows at approximately 5,000,000. Carp (*Cyprinus carpio*), large gizzard shad (*Dorosoma cepedianum*) and slow growing, small sportfish had dominated the fish population in Lake Balmorhea. The reservoir was subsequently re-stocked with sport fish and is now managed as a recreational fishery.

The TDA is responsible for registering all pesticides distributed in Texas. TDA's Endangered Species Pesticide Protection (ESPP) Program obtains local input about pesticide use and other management practices near endangered species habitat. TDA works with farmers and ranchers and others from agriculture, biology, conservation, and the chemical industry to develop recommendations about rates, timing and methods of application or effective alternatives for pesticide use to minimize impacts on endangered species and be acceptable to agriculture. In cooperation with the TDA, the Rio Grande Fishes Recovery Team, the Service, and the U.S. Environmental Protection Agency, an informal protected area, along the spring outflows, was established for limiting the agricultural use of chemicals such as trifluralin and emamectrin benzoate. The protected area (Figure 5) was designed to minimize impacts on the endangered fishes. The area includes: the lined outflow canal from Phantom Lake Spring (now dry); the outflow earthen drain canal from phantom Lake Spring, main canal from Giffin Spring; the outflow earthen drain canal from San Solomon Spring; and the first earthen lateral canal that connects the drain canal from San Solomon to the main outflow canal from San Solomon. In total, the protected area includes about 6 kilometers (3.7 miles) of ditch.

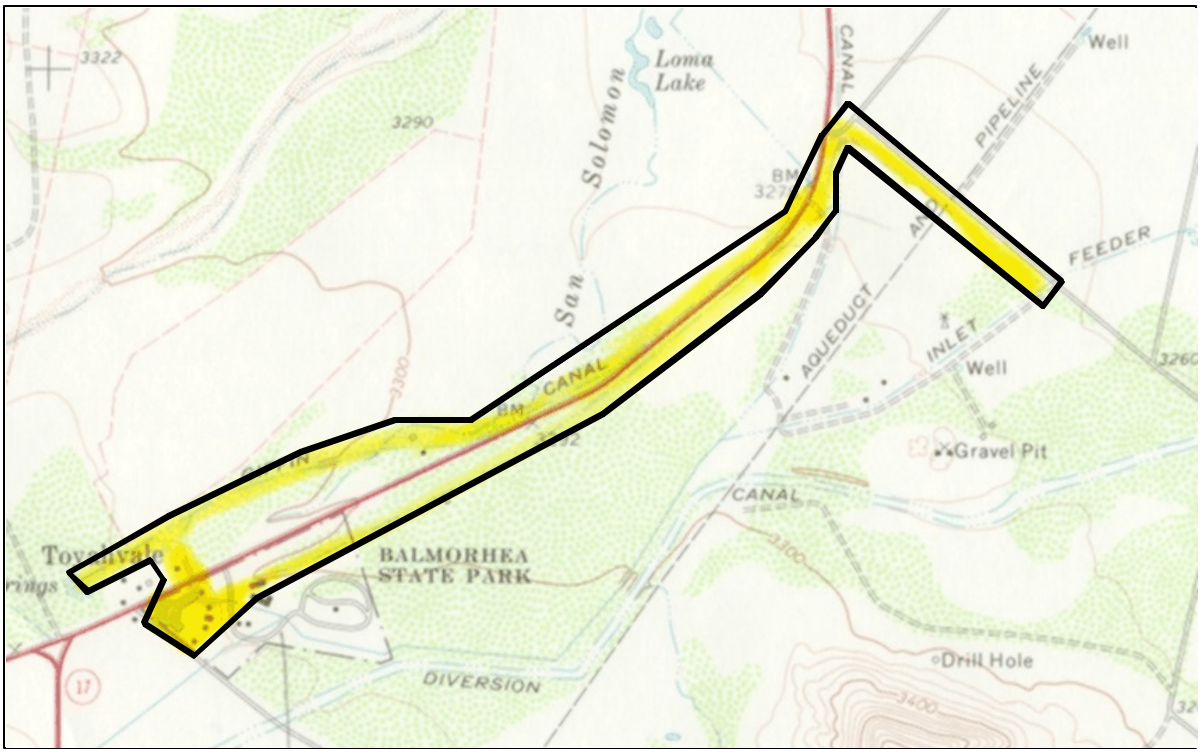


Figure 5. Highlighted area shows TDA's protected area where pesticides are not used

IV. Effects of the Action

a. Factors to be considered

The proposed action was determined to result in adverse effects to the endangered Comanche Springs pupfish and Pecos gambusia. Effects of the action include killing of fishes by diverting individuals onto fields during normal irrigation practices and stranding fish, likely resulting in death, during ditch maintenance actions when water from some sections of ditches are diverted and go dry. The proposed action occurs within the known range of both endangered fishes and will likely affect the pupfish more than the gambusia, due to higher numbers of pupfish expected to occur in the irrigation canals. There is no known seasonal difference in the use of the canals that would influence the nature of the effects of the actions. The duration of effects occurs sporadically throughout the year as water is diverted onto fields for irrigation. Drying of ditches would most likely occur during the winter months when irrigation is much reduced.

The District does not currently have mechanisms in place to reduce the effects of the irrigation operations on the endangered fishes. The installation of screens in the ditches has been suggested but has not been implemented due to the inability of the District to provide the necessary maintenance of screens and the likely limited benefit they would provide. It is not certain that screening would effectively prevent movement of fishes. Salvage and relocation of stranded fishes also has not been implemented for similar reasons (i.e., unrealistic maintenance costs and uncertain benefits to the conservation of the species) and to prevent the unintentional movement of nonnative species. If sheepshead minnows were to become established in the downstream reaches of the canal system, they would still be prevented from moving into upstream protected areas by various check dams and diversions in the canal. However, if stranded fish were being rescued and relocated upstream, sheepshead minnow could accidentally be introduced into protected areas. In this instance, salvaging stranded fish would have a larger negative impact on the species by threatening their survival due to hybridization, than allowing some individuals to die in canals. Once pupfish enter the canal system, which is poor habitat, they are unable to move back upstream into good habitat. In addition, the drying of canals may actually prevent establishment of hybrid populations and reduce threats of invasion in spring outlet areas upstream.

The above effects are considered to be severe to the individual fishes that are affected, likely resulting in death to individuals. The deaths of individuals from the drying of canals in Balmorhea has been documented by Davis (1979). The impacts on the population are continual and ongoing but of a short-term nature. Also, impacts vary geographically, because the water from the spring continually flows and some parts of the irrigation system always retain flowing water.

Different sections of the canals vary in their ability to support populations of endangered fishes. For example, the main canal from Balmorhea State Park to the reservoir is concrete-lined and maintains very high velocities. This section of the ditch is unlikely to support many fish. Only one section, the lateral ditch highlighted as the protected area in Figure 5, is a wider, slower, dirt-lined canal and provides intermediate-quality habitat.

None of the impacts from the proposed action are expected to occur within any of the spring outflow areas (San Solomon, Giffin, Phantom Lake, or East Sandia springs) or on Balmorhea State Park. No actions within these areas are included in the project description, and therefore, they are not included within the scope of this consultation.

b. Analyses for effects of the action

The proposed action by NRCS is to support the District in their irrigation practices and to allow the District to improve irrigation operations for land and water conservation. These are indirect effects resulting from the proposed action, since they are later in time, are reasonably certain to occur, and are anticipated to continue into the foreseeable future.

Individuals of both endangered fish species are likely to be periodically taken as a result of the proposed action. The take will be in the form of killing individuals due to either diversion of fish onto farm fields incidental to irrigation, or as a result of drying of a ditch for maintenance activities where fishes occur. Understanding that water will always be flowing in some part of the canal system, it is anticipated that less than half of the fish occurring in the canals would be impacted each year from irrigation operations and maintenance. It is anticipated that less than one percent of the population is actually lost due to the diversion of water onto fields. This is because of the small pipes used to move the water from the canals to the field.

c. Species' response to a proposed action

Because the effects from the proposed action by NRCS are results of ongoing actions by the District, and no changes to historic operations are currently proposed by the District, no appreciable reduction in the populations of either species are likely to occur.
The periodic loss of individuals from the canal system has a negligible impact on the species for the following reasons.

1. The proposed action does not adversely affect individuals in the spring outlets, where populations are more secure. Balmorhea State Park, including the swimming pool, pupfish canal, and San Solomon Ciénega provides protection for the endangered fishes in more natural habitats than the canals. Giffin Spring outflow is not proposed for any additional modifications under this action and should continue to provide secure habitat for both fishes. East Sandia Spring is owned and managed by The Nature Conservancy and provides protected habitat for the Pecos gambusia. These areas are better suited for protecting the quality of native fish habitat than are the artificial canals.

2. Fishes inhabiting the canals, downstream of the spring outlets, are occurring in artificial, marginal habitats. The canals are artificial habitats and do not represent preferred habitat and the canals do not resemble the natural conditions of the ecosystems in which these fish evolved. Once fish move downstream in the canal system, they can not move back up to the spring outlets and contribute to the population. Upstream fish passage is blocked by check dams and diversions. These barriers serve as important mechanisms for reducing the risk of sheepshead minnow invasions.

3. Endangered fish lost from the canal system are naturally recolonized from upstream populations in the spring outlets. The occurrence of fish in the canals is a result of downstream colonization. These may be vagrants of the populations in the spring outlets or represent individuals displaced from preferred habitats in the spring outlets. Therefore, the individuals in the canals are not considered as important to the overall conservation of the species in the preferred habitats of the spring outlets. Nothing in the proposed action prevents the continued colonization of the canals by fishes migrating, or being displaced, downstream from the spring outlets.

V. Cumulative Effects

Cumulative effects include the effects of future State, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

If future spring flows decline from San Solomon, Giffin, or East Sandia springs, endangered fish populations will be further stressed. This situation would have the potential to make the proposed action aggravate an already stressed ecosystem. It will be important to review the status of the baseline and the effects of the actions to ensure that the future situation will continue to support aquatic habitats for the listed fishes.

The other significant factor is the prevention of the upstream movement of sheepshead minnow from Lake Balmorhea to spring outflow areas. Expansion of the range of the sheepshead minnow would seriously compromise the existence of the Comanche Springs pupfish. However, nothing in the proposed action adds new opportunities for sheepshead minnow invasion from Balmorhea Lake.

Other factors, such as pesticide use, pool cleaning in the Park, and maintenance of the San Solomon Ciénega are future actions that are reasonably certain to occur that may affect these species.

VI. Conclusion

After reviewing the current status of the Comanche Springs pupfish and Pecos gambusia, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Comanche Springs pupfish and Pecos gambusia. No critical habitat has been designated for these species, therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be undertaken by the NRCS so that they become binding conditions of any contracts issued to participants in USDA's assistance programs within the District, as appropriate, for the exemption in section 7(o)(2) to apply. The NRCS has a continuing duty to regulate the activity covered by this incidental take statement. If the NRCS (1) fails to assume and implement the terms and conditions or (2) fails to require participants to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or contract document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the NRCS must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement.

Amount or extent of take anticipated

The incidental take of Pecos gambusia and Comanche Springs pupfish is difficult to quantify because the fish are small and hard to detect and identify and occurrence in the canals is often in remote areas on private lands. The Service, therefore, anticipates that up to 100 percent of the Comanche Springs pupfish and Pecos gambusia occurring in the irrigation canal system downstream of the protected areas (spring outflows, see Figure 5) and the outflow area of East

Sandia Spring could be taken in any given year as a result of this proposed action. The incidental take is expected to be in the form of killing individuals by drying of ditch habitat for maintenance and during diversion of water onto fields. The potential numbers of individuals taken during the period of the consultation is impossible to predict or detect for the following reasons:

1. The number of individuals occurring in the canal system is unknown.
2. The number of individuals impacted by the proposed action is unknown. On one occasion the number of individuals impacted from the drying of one section of ditch was documented (Davis 1979). But no other data exists on which to base any estimates of take.
3. No investigations of the number of individuals impacted by the diversion of water onto fields has been conducted. This effect is based solely on a reasonable assessment that the take occurs, but there is insufficient data on which to quantify the take of individuals.

The incidental take will occur over the 10-year period of this consultation, beginning with the date this biological opinion is signed. See limitations to the 10-year consultation period, explained in the Description of the Federal Action, page 3 above.

Effect of the take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Comanche Springs pupfish or the Pecos gambusia. No critical habitat has been designated for these species, therefore, none will be affected.

Reasonable and prudent measures

The Service believes the following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize impacts of incidental take of Comanche Springs pupfish and Pecos gambusia:

1. The NRCS will use it's USDA technical assistance programs within the District to educate District landowners on the opportunities to conserve Comanche Springs pupfish and Pecos gambusia in the District canals during irrigation operations.

2. For any NRCS-administered cost-share projects (for example, EQIP projects) within the District, NRCS will work with the landowners to implement projects to minimize impacts to, and, if possible, benefit the Comanche Springs pupfish and Pecos gambusia.

Terms and conditions

In order to be exempt from the prohibitions of section 9 of the Act, NRCS must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. To implement RPM #1, NRCS should educate District landowners about the need to minimize impacts to the endangered fishes during irrigation operations and preventing the expansion of the nonnative sheepshead minnow into upstream areas.

   A. Encourage District members to contact the TPWD or the Service if there is any proposed activity that could move fishes within the District's irrigation system.

   B. NRCS should include in Conservation Plans for landowners within the District considerations for actions to minimize impacts on listed fishes and for actions that could benefit the listed fishes. Examples of potential actions that could be considered are stated below, **Potential protective measures**.

2. To implement RPM #2, for cost-share programs within the District (for example, EQIP projects), if requested by the landowner, NRCS should include in the Evironmental Evaluation alternatives for structural or operational changes in the irrigation system to manage irrigation water for the benefit of the listed fishes and to minimize potential impacts to the listed fishes.

   A. Examples of potential actions that could be considered in cost-share programs to conserve the listed fishes are stated below, **Potential protective measures**.

3. To report on RPM's #1 and #2, beginning in December 2004 and every-other-year following for the 10 years this biological opinion is in effect (reports due on December 2006, 2008, 2010, and 2012), NRCS should provide a brief written report to the Service on the status of the proposed actions and documentation of compliance with the RPMs.

The number of individuals allowed to be taken is up to 100 percent of the fishes inhabiting the irrigation canals. The take is only authorized as part of the normal, historical irrigation operations of the District, downstream of spring outflow areas, identified as protected areas in Figure 5 above, and as described and analyzed in the biological opinion. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, incidental take occurs outside of the manner in which it is anticipated within this incidental take statement, such take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. NRCS will provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures. Because this consultation involves ongoing activities, the authorization for incidental take will expire with the biological opinion, 10 years from the date of signature. As stated in the Description of the Federal Action, page 3 above, future USDA assistance programs may change as a result of future legislation and

reinitiation of this consultation may be necessary. To ensure future unauthorized take does not occur, the biological opinion and incidental take statement should be updated and renewed prior to the expiration date.

Potential protective measures

The following actions are considered potential activities that could be incorporated into the USDA assistance programs that would have beneficial effects on the endangered fishes and serve to reduce the overall affects of the proposed action on the listed species:

1. To the maximum extent practicable, reduce the extent and duration of dewatering canals for maintenance. By limiting the length of canals that are dewatered and the time period the canals are dewatered, fewer individual fishes are likely to be affected as a result of the proposed actions.
2. Where feasible, consider experimenting with screens for diverting water temporarily into lateral canals and onto fields where permanent water will not be available to sustain fish. By reducing fish access to lateral canals and fields, the number of individuals likely impacted when the canals are dewatered will be reduced.
3. In lateral canals, where appropriate and possible, such as the first lateral canal highlighted on Figure 5, maintain permanent water in the canal and allow natural vegetation to persist along canal banks. This will provide some small areas of refuge for endangered fishes in the canal system and serve to minimize the number of individuals that may occur in other areas of the canal more susceptible to impacts from irrigation operations.
4. Do not intentionally or unintentionally move fish (or water that could contain fish) from locations downstream of Lake Balmorhea to locations upstream of Lake Balmorhea.
5. Maintain any barriers to upstream fish movement in the canal system (such as diversion structures, drop structures, and high-gradient concrete canals), particularly the inlet structure to Lake Balmorhea, that may serve to prevent upstream movement of sheepshead minnow.

Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. Implement fish barrier projects that will prevent expansion of the sheepshead minnow populations in the Toyah Basin. Cooperate with the TPWD and the Service on future projects to control sheepshead minnow in west Texas.

2. NRCS should considering coordinating fish studies to investigate the impacts of irrigation agriculture activities on the endangered fishes and determine methods for minimizing those impacts.

3. Develop an endangered species management plan for the District to emphasize conservation of the habitats of listed species and other rare species in the area.

4. Work with local landowners and researchers to facilitate access within the District for appropriate future investigations of the natural resources of the Toyah Basin.

5. As opportunities arise, NRCS and the District should participate in recovery activities and cooperate with the Rio Grande Fishes Recovery Team for the conservation of the Comanche Springs pupfish and Pecos gambusia.

6. NRCS should provide technical assistance to other agricultural producers in west Texas to promote the conservation of groundwater resources throughout the area. The long-term survival of the rare species in the Toyah Basin is dependent on the sustainability of the aquifers that provide spring flows for species' habitats. Continued operations of the District require the same spring flows.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

Reinitiation Notice

This concludes formal consultation on the actions outlined in the request for section 7 consultation. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently

modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for you cooperation during this consultation. If you have any questions regarding this biological opinion or any other needs please contact me or Nathan Allan at 512-490-0057.

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